

LOW CEILING TEMPERATURE PROCESS FOR A
PLASMA REACTOR WITH HEATED SOURCE
OF A POLYMER-HARDENING PRECURSOR MATERIAL

5 ABSTRACT OF THE INVENTION

A high plasma density etch process for etching an oxygen-containing layer overlying a non-oxygen containing layer on a workpiece in a plasma reactor chamber, by providing a chamber ceiling overlying the workpiece and
10 containing a semiconductor material, supplying into the chamber a process gas containing etchant precursor species, polymer precursor species and hydrogen, applying plasma source power into the chamber, and cooling the ceiling to a temperature range at or below about 150 degrees C. The
15 etchant and polymer precursor species contain fluorine, and the chamber ceiling semiconductor material includes a fluorine scavenger precursor material. Preferably, the process gas includes at least one of CHF_3 and CH_2F_2 .
Preferably, the process gas further includes a species
20 including an inert gas, such as HeH_2 or Ar. If the chamber is of the type including a heated fluorine scavenger precursor material, this material is heated to well above the polymer condensation temperature, while the ceiling is cooled. In some cases, the plasma source power applicator
25 is an inductive antenna overlying the semiconductor ceiling, and the ceiling has a cooling/heating apparatus contacting the ceiling through semiconductor rings. The inductive antenna in this case constitutes inductive elements between adjacent ones of the semiconductor rings.